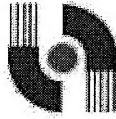


MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

**BMT1014 –MANAGERIAL MATHEMATICS**

( All sections / Groups )

27 OCTOBER 2017

9 a.m - 11 a.m

( 2 Hours )

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**INSTRUCTIONS TO STUDENT**

1. This Question paper consists of **6 pages** including cover page and mathematical formulas with **4 Questions** only.
2. Attempt **ALL** questions and write your answers in the Answer Booklet provided.
3. The candidate is allowed to use scientific calculators that are permitted to be used in the examination.

**Question 1 (25 marks)**

(a) Solve the quadratic-form equation  $x^2 - 4x - 8 = 0$

[6 marks]

(b) Solve  $\sqrt{10 - 3x} = \sqrt{2x + 5}$

[6 marks]

(c) (i) For the following equations:

$$4y - 3x - 12 = 0 \text{ and } 3x - 4y + 6 = 0$$

Sketch the lines and label them clearly in the same graph.

[3 marks]

(ii) State the gradient of each line and hence explain why the simultaneous linear equations in part (i) have no solution.

[3 marks]

(d) (i) A manufacturer sells television sets to stores for \$350 each. If  $R$  dollars is the revenue from selling  $x$  television sets, write down a formula which relates  $R$  to  $x$ .

[2 marks]

(ii) Given that the cost of producing each set is \$200, and that the initial set up cost for the equipment is a one off \$20 000, write down a formula which gives the cost  $C$  (dollars) of producing  $x$  television sets.

[2 marks]

(iii) How many sets does the manufacturer need to sell to avoid making a loss?

[3 marks]

**Question 2 (25 marks)**

A Commonwealth Games souvenir seller manages two stands in the city, one at the 'Square' and one at the 'Shed'. On average, per hour, each stand sells

Square:	10 caps and 6 tee-shirts
Shed:	15 caps and 4 tee-shirts

In total at least 300 caps and at least 120 tee-shirts must be sold over the first weekend of the Games.

**Continued...**

Let  $x$  be the number of hours that the stand at the Square is open  
 $y$  be the number of hours that the stand at the Shed is open.

The information can be expressed as four inequalities.

1.  $10x + 15y \geq 300$

2.  $6x + 4y \geq 120$

3.  $x \geq 0$

4.  $y \geq 0$

- (a) The council allows the stand at the Square to be open for up to 30 hours and the stand at the Shed to be open for up to 27 hours. Write down two extra inequalities for this additional information.

[2 marks]

- (b) Using the first four inequalities and the two extra in part (a), construct a graph and shade the feasible region. Label all corner points.

[12 marks]

- (c) The cost per hour of running each stand is

Square: \$60

Shed: \$80

- (i) Letting  $C$  be the total cost of operating the two stands over the period of the games, write down an equation for  $C$  in terms of  $x$  and  $y$ .

[2 marks]

- (ii) Find the number of hours each stand should be open, in order to minimize the total cost – justifying your answer. What is this minimum cost?

[9 marks]

### **Question 3 (25 marks)**

- (a) To buy a computer priced at \$2500 on hire purchase, a deposit of \$100 is paid, and weekly payments of \$20 are charged over three years.

- (i) Find the amount of interest that will be paid on the deal.

[2 marks]

**Continued...**

- (ii) Show that the flat rate of interest per annum on the deal is 10%. [1 mark]
- (iii) Find the effective rate of interest p.a. correct to one decimal place. [2 marks]
- (b) An investor places a principal of \$10 000 in an account which pays interest at 6% p.a. compound interest paid yearly. At the end of one year the investor adds another \$1000 to the principal and the accrued interest, and the balance then grows at 6% p.a. over the second year. At the start of the third year another \$1000 is added.
- (i) Find the amount in the account at the start of the third year. [3 marks]
- (ii) Show that the annuities formula gives the same result if we take  $R = 1000$ , and  $n = 2$ . [2 marks]
- (c) The price of a text book valued at \$45.50 rises by 2.5% in July and then a further 3.5% in November.
- (i) Find the price of the text book after the November rise. [2 marks]
- (ii) What single percentage rise (correct to one decimal place) would increase the original price of the book to its price after the November rise? [1 mark]
- (iii) Given that a student gets 10% discount on the final price of the book, what actual percentage discount does the student get on the pre July price of the text? Give your answer correct to one decimal place. [2 marks]
- (d) An investor wishes to borrow \$8000 to purchase a package of shares. The investor can borrow the amount from one financier who charges 7.5% simple interest with quarterly repayments over 5 years.
- (i) Find the quarterly repayment for this method of financing. [3 marks]
- (ii) An alternative way of financing the package is to borrow the amount as a reducing balance loan, with quarterly repayments at 12% p.a. over five years. The annuities formula models the progress of this type of loan. Find the quarterly repayment for the reducing balance loan. [4 marks]
- (iii) Which loan is better and how much is saved overall? [3 marks]

Continued...

**Question 4 (25 marks)**

(a) Differentiate the following functions using *product rule* and *quotient rule*

(i)  $y = (27 - 8x^3)(x^2 + x)$

(ii)  $y = \frac{6}{4t^2 + 3t - 22}$

[6 marks]

(b) Find an equation of the *tangent line* to the following curve at the indicated point:

$$y = \frac{3 - x^2}{2}; (1, -3)$$

[4 marks]

(c) Integrate the following functions:

(i)  $\int \left( \frac{12x^{10} - 5x^6 + 3x^2}{x^2} \right) dx$

(ii)  $\int_{-1}^2 (2 - x) dx + \int_2^4 \frac{12x}{(x^2 - 2)^2} dx$

[6 marks]

(d) If a curve has the equation  $f(x) = 3x^5 - 5x^3 + 3$  then:

(i) Calculate  $f'(x)$  and use this to find all points where  $f'(x) = 0$ .  
[3 marks]

(ii) Draw the sign diagram for  $f'(x)$ . State in interval notation the regions where the function  $f(x)$  is increasing and where it is decreasing.  
[3 marks]

(iii) Find the local maxima and local minima of  $f(x)$  by using second derivatives method.  
[3 marks]

**End of Page.**

## Summary of Principal Formulas and Terms

### Simple Interest

- (i) Interest,  $I = Prt$  ( $P$  = principal,  $r$  = interest rate,  $t$  = number of years)
- (ii) Accumulated amount,  $A = P(1 + rt)$

### Compound Interest

- (i) Accumulated amount,  $A = P(1 + i)^n$ , where  $i = \frac{r}{m}$ , and  $n = mt$   
( $m$  = number of conversion periods per year)
- (ii) Present value for compound interest,  $P = A(1 + i)^{-n}$

### Effective Rate of Interest

$$r_{\text{eff}} = \left[ 1 + \frac{r}{m} \right]^m - 1$$

### Future Value of an Annuity

$$S = R \left[ \frac{(1 + i)^n - 1}{i} \right] \quad (S = \text{future value of ordinary annuity of } n \text{ payments of } R \text{ dollars periodic payment})$$

### Present Value of an Annuity

$$P = R \left[ \frac{1 - (1 + i)^{-n}}{i} \right] \quad (P = \text{present value of ordinary annuity of } n \text{ payments of } R \text{ dollars periodic payment})$$

### Amortization Formula

$$R = \frac{Pi}{1 - (1 + i)^{-n}} \quad (R = \text{periodic payment on a loan of } P \text{ dollars to be amortized over } n \text{ periods})$$

### Sinking Fund Formula

$$R = \frac{Si}{(1 + i)^n - 1} \quad (R = \text{periodic payment required to accumulate } S \text{ dollars over } n \text{ periods})$$